UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,742	04/15/2004	Lid B. Wong	BIO1819P0031US	7061

32116 7590 04/19/2006

WOOD, PHILLIPS, KATZ, CLARK & MORTIMER
500 W. MADISON STREET
SUITE 3800
CHICAGO, IL 60661

EXAMINER	
KIANNI, KAVEH C	

ART UNIT	PAPER NUMBER
2883	

DATE MAILED: 04/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/824,742	WONG ET AL.	
	Examiner	Art Unit	
	Kianni C. Kaveh	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-49* is/are pending in the application.

4a) Of the above claim(s) *1-33 and 43-49* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *34-42* is/are rejected.

7)☐ Claim(s) *34 and 42* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 34-49, drawn to apparatus for measuring nonstationary oscillatory motion of a sample, classified in class 385, subclass 15.

II. Claims 1-33, drawn to a method for measuring nonstationary oscillatory motion of a sample, classified in class 385, subclass 141.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used for imaging of objects such an IC for defect analysis rather than using process steps such as generating power spectral densities of photon count sequences using cumulative autocorrelation analysis and a step of deriving a ciliary beat frequency and a metachronal wave period of the cilia as claimed in group I process claims.

Because these inventions are independent or distinct for the reasons given above and the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

This application contains claims directed to the following patentably distinct species:

Group IA, claims 34-42 directed to including a plurality of detectors, each detector being coupled to a pair of optical fibers comprising a detecting optical fiber and a modulating optical fiber.

Group IB, claims 43-47 directed to including a plurality of modulating optical fibers wherein each modulating optical fiber is coupled to a detecting optical fiber of said plurality of detecting optical fibers.

Group IIA, claims 1-14 directed to including coupling each optical fiber of said plurality of detecting optical fibers with a modulating optical fiber; and generating measurements of said nonstationary oscillatory motion of said sample.

Group IIB, claims 15-23 directed to including detecting reflectedback scattered light from said sample with a plurality of detecting optical fibers positioned around said illuminating optical fiber in a predetermined arrangement; and generating measurements of said nonstationary oscillatory motion of said sample.

Group IIC, claims 24-33, directed to including generating measurements of ciliary nonstationary oscillatory motion of an organic tissue.

The species are independent or distinct because each of the above group limitations is directed toward an invention that would require a different search that that of other group inventions.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, none of the claims are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

During a telephone conversation with Mr. Katz on 4/11/06 a provisional election was made with traverse to prosecute the invention of Group IA, claims 34-42. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-33 and 43-49 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

Claims 34 and 42 are objected to because of the following informalities: the word reftectedbackscatterered is misspelled as sine it requires a space between 'reflected' and 'backscatterered'. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 34-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over combination of Ozanich (US 2002/0011567) and Rollins et al. (US 200/30137669) .

Regarding claims 34, 36, Ozanich teaches an apparatus for measuring non-stationary oscillatory motion of a sample (shown in at least fig. 1c, also par. 0101), said apparatus comprising:

a light source 120; an illuminating optical fiber coupled to said light source 120 (see parag. 0055 and 0014);

and a plurality of detecting optical fibers positioned systematically around said illuminating optical fiber in a predetermined arrangement (see at least fig. 1-3, item

detecting fibers and par. 0054) and coupled to receive reflected backscattered light from said sample (see at least parag. 0002 and 0104).

a plurality of detectors, each detector being coupled to a pair of optical fibers comprising a detecting optical fiber and a reference optical fiber (see at least fig. 1 and 1D, item light detectors 170/200 having a pair of reference light detection fiber output as well as detecting light reflected fiber output, and parag. 0081, specifically last 2 lines of page 8-first 6 lines of page 9).

However, Ozanich does not explicitly state that the above sample is that the above reference optical fiber is 'modulating' and a beam splitter coupled to said light source and the detecting optical fibers are single mode optical fibers. Nonetheless, that a plurality of optical sources 120/123 such lasers are used as signal sources producing spectra frequency carrying signal. These limitations are more specifically taught by Rollins. Ozanich teaches an apparatus for measuring non-stationary oscillatory motion of a sample that includes modulating optical fiber (shown in at least fig. 11). Thus, Ozanich provides additional teachings of imaging of moving objects as tissue. Thus, it would have been obvious to a person of ordinary skill in the art when the invention was made to combine the teachings of Ozanich with that of Rollins concerning modulating reference signal as taught more specifically by Rollins in order to produce an apparatus for measuring non-stationary oscillatory motion of a sample that includes all above limitations provided that a single mode fiber is extremely convention and widely used in fiber optic systems and since such detection/measurement and analysis of input/output signal transmission/receiving of

optical signal in the apparatus would provide signal representation of a sample/object characteristics (see 0002).

Ozanich further teaches wherein said light source comprises a laser light source 120; wherein said plurality of detecting optical fibers are arranged symmetrically around said illuminating optical fiber (shown in at least fig. 1); a modulating optical fiber bundle having a plurality of modulating optical fibers (see at least fig. 1, item references coupled to the source which are light coupling reference fibers/fiber-bundle); wherein each detecting optical fiber of said plurality of detecting optical fibers is coupled to a modulating optical fiber (see at least parag. 0081, specifically last 2 lines of page 8-first 6 lines of page 9); a plurality of detectors, each detector being coupled to a pair of optical fibers comprising a detecting optical fiber and a spectra frequency carrying optical fiber (see at least fig. 1 and 1D, item light detectors 170/200 having a pair of reference light detection fiber output as well as detecting light reflected fiber output, and parag. 0081, specifically last 2 lines of page 8-first 6 lines of page 9).

- *Below is the non-final rejection of at least claims 34-43 that was originally rejected in the parent applicant, now abandoned, in which is pertinent to rejection of these claims as follows*:

Claims 34-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,807,264 to Paltieli, in view of Yang, U.S. Patent Pub. No. 2002/0101593).

Paltieli (264) discloses an apparatus that includes an endoscope in the form of a long, slender, rigid tube 2 insertable at one end into the body to be examined. The opposite end of the rigid tube 2 is connected via a flexible sleeve 4 to a source of light 6 for illuminating the interior of the body to be examined, and a light measuring circuit 8 for measuring the back-scattered light from the interior of the examined body.

The source of light 6 is a laser. It is coupled via a fiber coupler 10 to the end of a single mode fiber 11 extending via the flexible sleeve 4 into the endoscope 2 for transmitting the light from the laser to the examined body. Endoscope 2 and the flexible sleeve 4 include two further optical fibers 12, 13; these are multimode fibers and are connected to the light measuring circuit 8 for transmitting thereto the back-scattered light from the examined region.

The light measuring circuit 8 is more particularly illustrated in FIG. 2. It includes: two light detectors 14, 16, one for each of the two light-collecting fibers 12, 13; two preamplifiers 18, 20 for preamplifying the outputs of the two light detectors 14, 16; and a differential amplifier 22 for receiving the amplified outputs of the two light detectors. The output of differential amplifier 22 thus corresponds to the momentary difference in the amount of light received by the two light detectors 14, 16 from their respective collector fibers 12, 13.

The output from differential amplifier 22 is fed to a bandpass filter and gain control unit 24 to amplify the range of frequencies of typical cilia beats (0.5-30 Hz). The gain of unit 24 is controlled by a variable-gain potentiometer 26 (FIG. 1). As further shown in FIG. 1, the output from the light measuring circuit 8 is fed, via an analog-to-digital converter 28 to a digital processor 30 for processing and display via a display unit 32. See Column 2, line 47-67; and Column 3, line 1-15.

Paltieli (264) also discloses that each light detector 14, 16 is preferably a photodiode and includes a narrow bandwidth filter 14a, 16a (FIG. 2) for passing only the wavelength of the laser 6, thereby eliminating the effects of surgical ambient or

other extraneous white light not supplied from the laser. As indicated earlier, utilizing two collecting optical fibers reduces the artifacts originating from breathing and heartbeat motions of the patient and hand motions of the surgeon or physician since such motions would affect both optical fibers in the same manner and thus tend to cancel out by the differential amplifier 22. On the other hand, fluctuations resulting from ciliary motion are detected by the two collector fibers in two different laser coherence areas (phases), which are random and therefore do not cancel out. As a result, a relatively high signal-to-noise ratio is produced at the output of the differential amplifier 22. See Column 3, line 50-65. Paltieli further discloses that processor 30 may be a personal computer, which samples the output signals from the analog-to-digital converter 28 according to user-specified sampling parameters, and stores the data in the computer memory in a direct memory access mode. This enables accumulating and processing the data simultaneously. User-chosen parameters would include: averaging time (in minutes), the number of sampling points N (e.g., 32, 64, 128, 256, or 512), and maximum frequency (cycles/sec.). The maximum frequency (Fmax) determines the sampling rate, which is set at 2 x Fmax. For each array of N sampled data points, Fourier transformation and squaring yield the power spectrum of all the frequencies up to FinaX. A larger number of sampling points N gives the same overall shape of the power spectrum at higher frequency resolution, but obviously takes longer to sample and calculate, and therefore yields a slower real-time response to the operator. The averaging time determines how many separate power spectra will be averaged in the final power spectrum. The parameters that gave an optimum signal to noise ratio, with fast response time were found to be: average time of 0.6 min, 128 sampling points, and maximum frequency of 20 Hz, giving a display of updated spectrum ever 3.2 seconds, and final frequency power spectrum averaged for 11 spectra. Nine measurements of cilial beat frequency (CBF) of fimbria of excised human fallopian tubes were made with these parameters. The mean ± SEM value for the CBF was 5.9±0.5 (4.7-8.4) Hz. FIG. 9 illustrates the results as displayed in the computer monitor (32, FIG. 1) which was obtained during laparoscopy of one of the women

examined (Case No.2), utilizing the parameters specified in FIG. 9. The obvious frequency peak around 4.7 Hz pointed by the cursor corresponds to the CBF. See Column 4, line 31-48; and Column 5, line 1-9. It is implied herein that the use of two different laser coherence areas in accordance with Paltieli (264) is equivalent to the use of modulated light as recited in. Paltieli (264) as applied above does not disclose the use of a beam splitter. However, Yang (593) discloses in FIG. 8 a fiber optic system 200 for light delivery and/or collection in conjunction with the light scattering spectroscopic systems and methods of the invention described previously. A light source provides a beam 202 that includes at least two wavelengths Al, A2, which are coupled to the proximal end of optical fiber 204. A beam splitter 206 incorporated into the fiber optic system delivers light components through fibers 208 and 210, and through lenses 216 and 214, respectively. A first light component is reflected by moving mirror 220 traveling in direction 220, and returns through fibers 210 and 212. A second light component is directed onto tissue 218, and light scattered by the tissue is returned through fibers 208 and 212. Dichroic mirror 230 *separates the two* wavelengths A_1, *and* A_2, *which are* detected by *detectors 240* and 242, respectively. The heterodyne detection systems 250 and 252 are used to process the detected systems as described previously in connection with FIG. 1. The systems described herein can be used in conjunction with standard endoscopics to provide diagnostic information retrieved from lumens or tissue within the human body in vivo. See Paragraph [0064]. Therefore it would have been obvious to one of ordinary skill in the art that the cilial motion detection apparatus and method of Paltieli (264) can be modified to use a beam splitter in accordance with Yang (593), to provide diagnostic information retrieved from lumens or tissue within the human body in vivo.

Citation of Relevant Prior Art

Prior art made of record and not relied upon is considered pertinent to applicant's disclosure. In accordance with MPEP 707.05 the following references are pertinent in rejection of this application since they provide substantially the same information disclosure as this patent does. These references are:

US 6847447 B2 Ozanich; Richard M.

US 6512577 B1 Ozanich; Richard M.

These references are cited herein to show the relevance of the apparatus/methods taught within these references as prior art.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to K. Cyrus Kianni whose telephone number is (571) 272-2417.

The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 6:00 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font, can be reached at (571) 272-2415.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 872-9306 (for formal communications intended for entry)

or:

Hand delivered responses should be brought to Crystal Plaza 4, 2021 South Clark Place, Arlington, VA., Fourth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956.